CEREAL SCIENCE *today*

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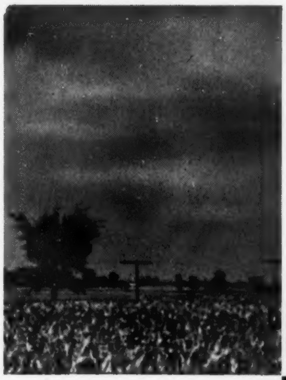
AN OFFICIAL PUBLICATION OF THE AMERICAN ASSOCIATION OF CEREAL CHEMISTS

OF INTEREST THIS MONTH

WHEAT QUALITY EVALUATION
INSECT INFESTATION OF GRAIN
UREASE ACTIVITY IN SOYBEAN PRODUCTS

VOLUME 3 • NUMBER 1 • JANUARY 1958



CEREAL SCIENCE *today*

FEATURES

TECHNICAL SECTION

DEPARTMENTS

STAFF

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Editorial

TECHNOLOGY IN THIS twentieth century has truly become an involved vocation. Thus food technology now embraces a wide gamut of interests and professional specializations. Beginning with electronics, radiations, and microbiology, it expands progressively to ultimately include great mechanical devices and vast structures. To apply our expanding scientific knowledge gained through basic research to food technology necessitates a reasonable familiarity with this entire area of human interests. A new human food, to merit serious interest in these times must be developed and promoted in terms of its nutritional value. This may involve the content of amino acids contributed by the proteins present, vitamins, minerals and other constituents. Any additives included in the formula must first be subjected to intensive tests to demonstrate that they are not harmful in the proportions in which they are present. The effects of the processing to which the basic components of the food are subjected in the factory must be determined in order to ascertain whether they are appreciably modified chemically or physically to a degree that will affect their nutritive value or delectability. Indeed, such studies may lead to ingenious and useful modifications of the processing that enhance quality, and possibly reduce labor and other costs of production.

Here is where the food chemist, physicist, and engineer often join forces in designing and testing novel equipment for use in the production of new and improved food products. The modern technologist, to merit that title, must be able to understand and apply the physical and engineering principles involved to his particular problems. While he should not be expected to be able to design all the engineering details involved in the construction of major machines and structures, he perforce must understand the limitations sometimes imposed and thus work within the bounds of practicality.

Also, the food technologist must apply some considerable understanding of economics. The elements of costs of raw materials and of processing, plant overhead and depreciation, sales promotion, distribution and other details may determine whether or not it is rational to seriously attempt large scale production of a new food product.

Thus the competent food technologist, in collaboration with other specialists, becomes the key member of a team that effects the application of the results of fundamental research and engineering advances to better living, as measured by improved nutrition, convenience, and costs. These are significant elements of a modern and advancing society.

C. H. BAILEY

HARD RED SPRING WHEAT:

Quality Evaluation in North Dakota Wheat Hybrids

By R. H. Harris, L. D. Sibbitt, and G. M. Scott *

THE CEREAL CHEMIST'S responsibility in evaluating and recommending new wheat varieties has been enormously increased by the use, in an effort to obtain rust resistance, of parental materials differing markedly in quality. Often it is very difficult to determine whether a wheat possessing excellent rust resistance is good enough in quality to permit its release. The wheats to look for are those which not only possess high quality, but which do not vary greatly over a range of environmental conditions.

To evaluate the influence of environment on wheat quality, varieties are grown at a number of locations under strictly comparable conditions. Several wheats which have been found acceptable in quality are commonly included in all the experimental plots, so as to obtain standards for comparison. Plots are usually one-fortieth to one-sixtieth of an acre, and cultural practices are similar to those used by the average farmer. Then, in the final evaluation of a variety, its performance under various conditions can be compared with those of the standard wheats. These data are also suitable for statistical analysis and interpretation, which increase the reliability of decisions based on the results.

In initiating a wheat breeding project with a specific aim, parent varieties are selected which combine the characteristics desired — rust resistance, other good agronomic attributes, and satisfactory quality. Each original cross produces but one seed which contains *all* the genes of the two parents. Each seed of the next generation is different, and may possess any possible combination of the characteristics of the original parents. Chances are remote at this stage for obtaining all desirable attributes in one individual kernel.

The time required to develop and release a new wheat variety has been significantly lowered. At least two generations can be grown in one year in the greenhouse. When sufficient seed of a promising variety is available, the wheat also can be increased during the winter months, under irrigation, in Arizona or California. When this is done, yields are large and an ample supply of seed is sent north for spring planting.

Hard red spring wheat varieties grown in the experimental plots of North Dakota, for quality evaluation by the Department of Cereal Technology, North Dakota Agricultural Experiment Station, have passed agronomic and micro-quality tests while being grown in the nursery rows. They are candidates for consideration for release, subject to approval by further, more exacting field and macro-quality evaluation. Tests fall into three categories: analytical, milling and baking, and physical dough tests.

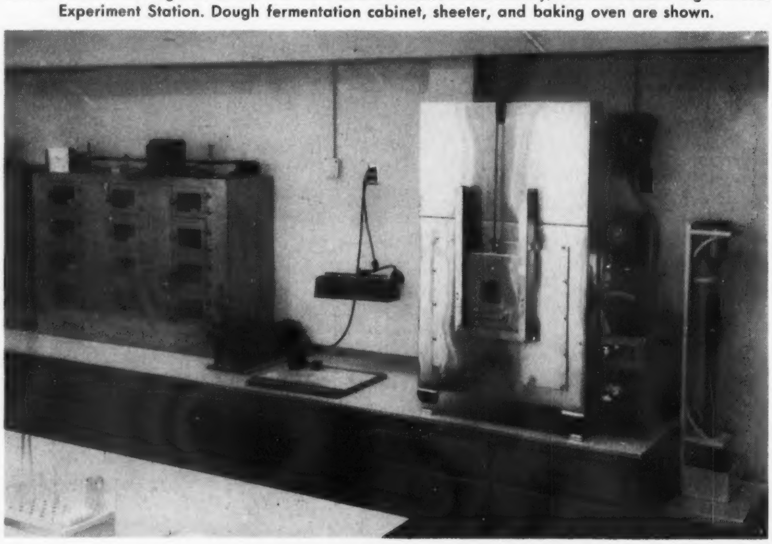
Analytical Methods

Analytical methods are essentially those outlined in *Cereal Laboratory Methods* (1). The determination of specific flour volume has been described by Harris and Bruner (2) as the volume occupied by 1 g. of flour. Sedimentation values are assayed by Zeleny's method (8).

Milling and Baking Tests

The milling and baking procedures were described by Sibbitt, Scott, and Harris (6). The Allis-Chalmers experimental mill is used for milling; the malt-phosphate-bromate formula for baking. Two fermentation times

Corner of the baking section in the new Grain Products Laboratory, North Dakota Agricultural Experiment Station. Dough fermentation cabinet, sheeter, and baking oven are shown.



* Department of Cereal Technology, North Dakota Agricultural Experiment Station, Fargo, N.D. Published with the approval of the Director.

determine the fermentation tolerance of the wheats.

Physical Dough Tests

Dough-mixing properties are obtained with the farinograph, using the 50-g. bowl with a flour-water dough (5). Dough resistance and extensibility are ascertained with the Extensograph®, using a flour-water dough containing 1.0% sodium chloride and 0.003% potassium bromate (flour basis). Doughs are stretched after 45 and 180 minutes' rest (4).

Statistical Methods

By analyses of variance, some of the more pertinent observations are made on the distribution of variance among the various causal factors. This technique is valuable for analyzing the differential effects of variety and environment; it is used by plant breeders in sorting out their numerous lines for promising future varieties.

Typical Results of Variety Testing

Eight wheats, comparably grown at each of six stations in North Dakota, were selected to illustrate the testing procedures employed. Four of the wheats discussed — Thatcher, Mida, Lee, and Rushmore — have been grown for some years on farms in the hard red spring wheat area. Three of the others are resistant to the prevailing biotypes of 15B stem rust: Selkirk, which originated in Canada; Conley, which was developed at the North Dakota Experiment Station; and ND 3. The latter wheat and 227 are still under test and have not been officially named. Two additional wheats, ND 8 and ND 19, have more recently entered the plots and were not grown at all of the six stations, but are included as examples of varieties probably unsuitable for release to farmers because of deficiency in quality.

Analytical Data

Table I shows the analytical characteristics of the eight varieties. Rushmore, Thatcher, and Mida tended to be lowest in yield per acre and protein content. ND 8 and ND 19 were much lower in flour yield and milling performance than the others, and it is extremely doubtful that these should be released, despite ND 8's high yield per acre. Thatcher and Mida were significantly lower in absorption than the other six comparably grown varieties. The definitely high flour ash content of ND 3 would be an adverse factor in a decision regarding the future of this wheat.

Table I. Variety and Station Averages for Yield, Protein Content, and Other Quality Factors
(Arranged in order of decreasing protein content)

Variety and Station	*Yield per Acre*	*Wheat Protein*[a]	*Flour Yield*[a]	*Flour Ash*[a]	*Flour Absorption*[a]	*Specific Flour Volume*	*Sedimentation Value*
	bu	*%*	*%*	*%*	*%*	*ml/g*	*ml*
			Variety means				
Lee	25.8	15.8	71.1	0.43	64.8	2.18	61.0
227	27.4	15.7	70.8	0.44	65.0	2.14	54.9
Conley	23.6	15.7	71.7	0.42	65.2	2.14	66.9
ND 3	25.0	15.7	71.6	0.54	65.1	2.13	41.1
Selkirk	27.0	15.2	72.2	0.43	61.9	2.13	62.2
Rushmore	22.6	15.1	72.9	0.41	61.9	2.18	63.2
Thatcher	21.0	14.8	71.0	0.42	61.3	2.16	60.5
Mida	22.9	14.3	72.6	0.42	61.2	2.27	51.6
Average	24.4	15.3	71.7	0.44	63.3	2.17	57.7
Range	6.4	1.5	2.1	0.13	4.0	0.14	25.8
ND 8[b]		15.9	62.8	0.34	62.4	2.80	70.4
ND 19[c]		15.3	64.4	0.43	59.7	2.99	56.4
			Station means				
Williston	18.7	16.0	69.9	0.39	63.6	2.10	61.2
Langdon	27.6	15.9	72.4	0.45	63.3	2.17	62.7
Dickinson	27.4	15.4	72.0	0.40	64.5	2.11	55.3
Minot	30.2	15.2	72.8	0.40	63.0	2.18	60.9
Edgeley	18.3	15.0	71.9	0.50	63.7	2.21	54.8
Fargo	24.5	14.1	71.6	0.49	61.6	2.21	51.0
Average	24.4	15.3	71.8	0.44	62.3	2.17	57.7
Range	11.9	1.9	2.9	0.11	2.9	0.11	11.7

[a] Expressed on 14.0% moisture basis.
[b] High in yield.
[c] Low in yield.

The relative placing of the varieties for any characteristic may vary with the station. To evaluate the effect of stations on the variety it is necessary to have data relating to the causes of variation. These include variety, station, and year of growth, unless some other measurement of error than the triple interaction of varieties × stations × years is available.

As usual, yield and protein content were affected more by environment than by variety. Differences in flour yield between the stations accounted for about 39% of the total variance. Variation in flour ash was significant and slightly greater for stations than for the varieties, the values for the three stations in the more eastern section of the state being higher than the others. For flour absorption Fargo was lowest, but the range between stations was less than between the eight varieties grown at all the stations.

Specific flour volumes were average for the eight wheats, but markedly high for ND 8 and ND 19. It has been found that varieties low in flour yield tend to have high flour volume. Sedimentation values were markedly different among the varieties; several which possessed high sedimentation values were classified as "strong," while ND 3, with the lowest value, was probably the weakest of the eight wheats grown at all six stations.

For sedimentation value, varieties accounted for 62.5% of the total variation and stations only 18.5% (Rosander, 7). This might be interpreted to mean that sedimentation is largely a varietal characteristic and not markedly affected by environmental conditions.

Baking Data

As shown in Table II, Conley was best in loaf volume at 3 hours of fermentation and Mida was poorest. Mida has been accepted by the milling industry, however, and it is thus apparent that all eight varieties were satisfactory in loaf volume. There was no significant difference between average volumes for the two fermentation periods, although there were significant variations between individual varieties. The longer fermentation is used to bring out residual strength. This seemed to correctly place Conley, an exceptionally strong wheat. Crumb color was satisfactory, although that of ND 3 was somewhat

Table II. Variety and Station Averages for Baking Quality

(Arranged in order of decreasing 3-hour loaf volume)

Variety and Station	Loaf Volume		Crumb Color	
	3-Hour	2-Hour	3-Hour	2-Hour
	cc.	cc.		
Variety means				
Conley	867	839	8.1	8.2
Selkirk	844	789	8.1	7.8
227	844	853	7.9	7.9
Thatcher	822	843	7.6	7.8
ND 3	818	786	7.4	7.2
Lee	786	823	7.8	8.1
Rushmore	778	795	7.6	8.0
Mida	757	819	8.0	8.3
Average	815	818	7.8	7.9
Range	110	67	0.7	1.1
ND 19	810	840	8.2	8.5
ND 8	778	810	7.2	8.0
Station means				
Langdon	895	824	8.1	7.7
Minot	828	861	7.8	8.2
Edgeley	821	799	7.6	7.8
Dickinson	804	807	7.8	7.9
Williston	783	867	8.1	7.9
Fargo	754	753	7.5	7.8
Average	815	818	7.8	7.9
Range	141	114	0.6	0.5

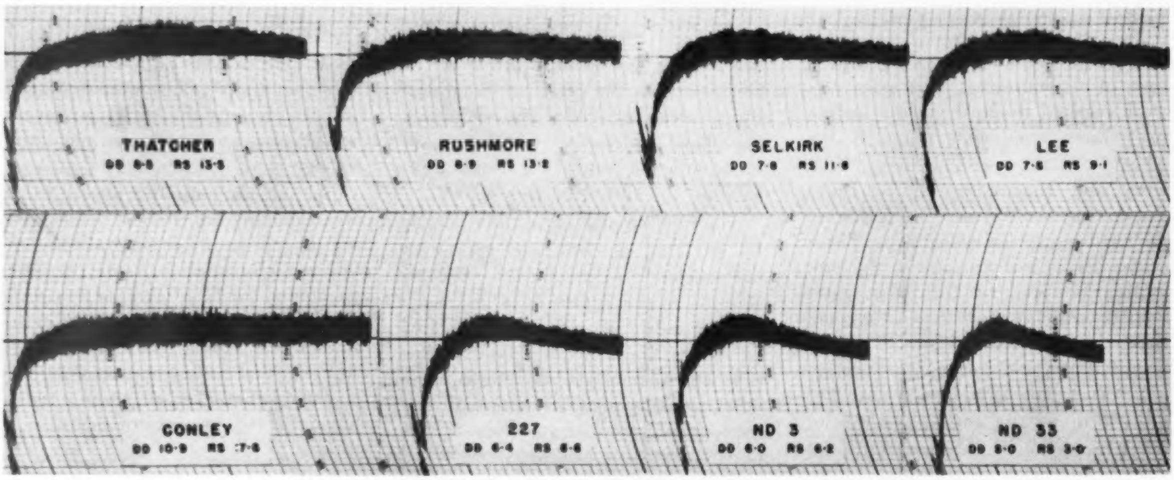
lower than the others. Average color was almost the same for both fermentation times.

As for protein content (Table I), Fargo-grown wheat flour was lowest for loaf volume. While Williston had the highest protein content, it was the second-lowest in 3-hour loaf volume, and showed the greatest difference between fermentation times. Langdon, with high protein content, had the highest 3-hour loaf and the second-largest spread between fermentation times. Variation in protein content caused by station differences, as shown by analysis of the data, was nearly double that of the varieties. For crumb color also, the difference between stations was greater than between varieties, while flour volume was affected about equally by variety and location of growth.

Sedimentation did not appear to be indicative of loaf volume or mixing requirements and was not related to protein content. Similar conclusions were reported by Harris and Sibbitt (3) from a study of hard red spring wheat nursery material, although a significant correlation with loaf volume was noted when the flours were baked with an equal part of soft wheat flour.

Physical Dough-Testing Data

In the accompanying farinograms, with corresponding values for dough development time and range of stability, the curves are arranged in order of decreasing stability from left to right within each group of four. For the standard wheats, Thatcher had the greatest stability. Selkirk and Lee had short dough development times and low stabilities; Conley was exceptionally high in both development and stability. The remaining three were the lowest of the eight wheats, and would be classed as on the borderline of being unsatisfactory for strong-type flours useful for imparting strength to flour blends. The weakest, ND 33, does not justify consideration for release as a hard red spring wheat in spite of its excellent rust resistance and other desirable agronomic qualities and excellent loaf volume at optimum mixing time.

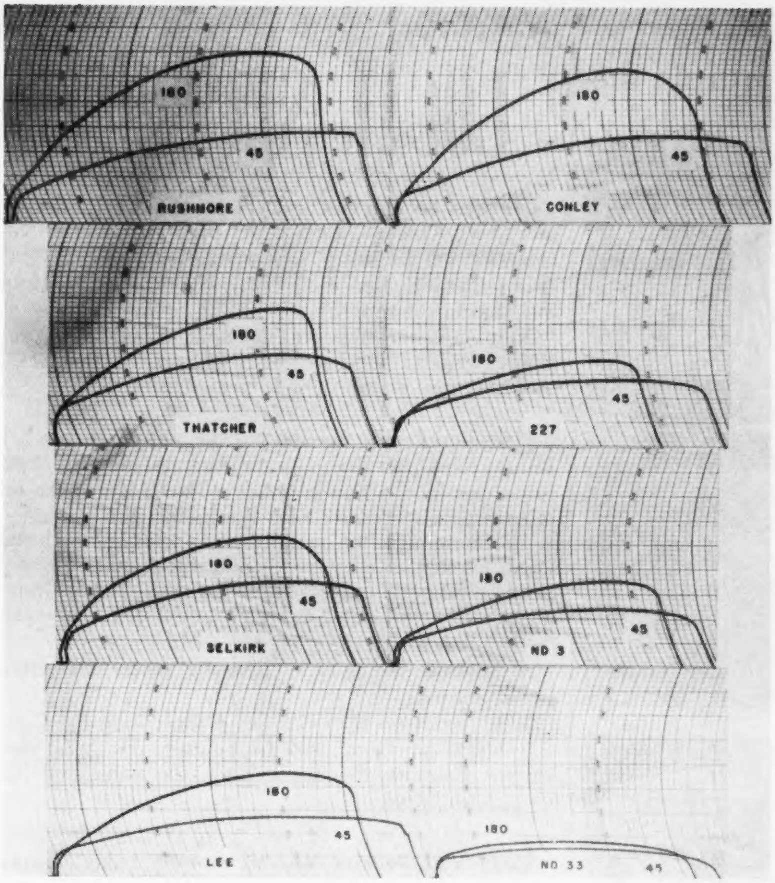


Representative farinograms of eight wheat flours, with comparative dough development and range of stability values, in cm.

Table III summarizes an analysis of variance of the farinogram measurements for the eight wheats grown at six stations. Varieties and stations affected dough development and stability to approximately the same extent. Thus, these mixing properties cannot be entirely varietal, but are dependent partially upon the environment of the wheat during growth. These results vary from those of Harris *et al.* (4, 5), which showed that the influence of variety on physical dough properties was greater than that of environment.

Average Extensogram® patterns of the wheats, arranged in order of decreasing resistance of the doughs to extension after 180 minutes of resting, are given herewith. Of the standard varieties, Rushmore had greatest resistance and Lee the lowest; of the new wheats, Conley was highest. There is little doubt that both ND 3 and ND 33 should be classed as unsatisfactory, while 227 might be acceptable. These three wheats exhibited little response to bromate and probably would require a different maturing treatment from that of hard red spring wheats now being produced. For extensibility there were also significant differences between varieties, as will be shown.

Table IV summarizes an analysis of variance of the Extensogram® data for the eight varieties from six stations. For the three chief sources of variation, the variances exceeded the 1% point of significance, using either the appropriate double interaction or the triple interaction as the error term. For the interactions, the triple interaction sufficed for error. For re-



Representative Extensogram patterns of eight wheat flours, 45 and 180 minutes after mixing.

Table III. Analysis of Variance of the Farinograph Data

Source of Variation	*Degrees of Freedom*	*Variance*[a]		*Percent of Total Variance*[a]	
		D. D.	*R. S.*	*D. D.*	*R. S.*
Between varieties	7	15.70**	89.40**	48.9	36.5
Between stations	5	18.29**	111.63**	44.2	35.1
Interaction					
Varieties × stations	35	2.99	10.29	6.9	28.4
Total	47			100.0	100.0

[a] D. D. = dough development, R. S. = range of stability.

Table IV. Analysis of Variance of the Extensograph Data

Source of Variation	*Degrees of Freedom*	*Variance*	
		Resistance	*Extensibility*
Between varieties	7	151430**	13.43**
Between stations	5	142445**	48.41**
Between rests	1	791340**	146.53**
Interactions			
Varieties × stations	35	17551**	3.28**
Varieties × rests	7	12628**	2.21
Stations × rests	5	3328	1.71
Varieties × stations × rests	35	2284	1.19
Total	95		

sistance to extension, the effect of varieties and stations were approximately equal, but for extensibility the effect of stations exceeded that of varieties. The effect of rest period was much greater than that of varieties or stations for both resistance and extensibility. Harris, Sibbitt, and Mundinger (4) found that varieties exerted a greater effect than stations on resistance and extensibility, but the varieties were not identical in the two studies. This may have contributed to the disparity in results.

The varieties did not respond in the same manner to environmental differences, as shown by the significance of the variety × station interaction. Also, the wheats reacted differently to the effects of variations in rest period on resistance to extension, but not on extensibility.

Correlations between some of the more pertinent quality factors are given below:

Variables correlated	*Correlation Coefficient*[a] (N = 82)
Wheat protein content and:	
Loaf volume	+0.525
Range of stability	−0.350
Resistance	−0.440
Dough development time and:	
Range of stability	+0.871
Resistance	+0.748
Extensibility	−0.028

[a] All coefficients except the last exceeded the 1% level of significance.

Wheat protein content was directly correlated with loaf volume, but inversely with dough stability and resistance to stretching. As expected, a highly significant relation existed between dough development time and stability, and a lower but still significant relation between dough development time and resistance to extension. Dough development time and extensibility at 180 minutes were not related.

Summary

This report discusses and illustrates some of the procedures involved in evaluating new hard red spring wheat hybrids for quality after preliminary nursery tests have shown that the wheats are promising. The use of physical dough-testing equipment has provided pertinent information on mixing requirements and dough stability. Thus, it has aided in eliminating wheats which otherwise would have been judged suitable for release because of satisfactory milling and baking properties.

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A.A.C.C.

LOCAL SECTIONS

Midwest Section met on December 2nd at the Builders' Club, Chicago. Lt. Col. George E. Danald, Nuclear Effects Engineer, Quartermaster Food & Container Institute, spoke on "How the Atom Can Help the Man in the Street."

New members are Ken Chapin, C. Edith Weir, Robert Bundus, George Vondriska, and Marion Serafinski.

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Canadian Prairie Section No. 14 met on November 19th in the Grain Exchange Building, Winnipeg. S. N. Jones, president, Winnipeg Grain Exchange, spoke on "Current Problems in Grain Marketing in Canada."

The December 3rd meeting was a joint one with the Local Section of the Canadian Institute of Chemistry at the Grange Hotel. Mel Thistle, chief, Public Relations Office, National Research Council, Ottawa, spoke on "Why You Can't Put That in Plain English."

A new member is G. A. Gamsby, editor, **Canadian Grain Journal.**

J. A. Anderson is in Europe, representing the Canada Dept. of Trade and Commerce. He will visit France, Belgium, the Netherlands, Germany, and the United Kingdom.

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Lone Star Section No. 10 met at Lake Murray Lodge, Ardmore, Oklahoma, on September 6th and 7th. A. M. Schlehuber, Oklahoma State University, spoke on "Common Fallacies Concerning Wheat"; E. A. Vaupel, technical Director, Food Industries, Dallas, Texas, spoke on "Some Observations on Fungal Enzymes in Baking"; and Arnold Kaehler, Special Foods Co., Red Wing, Minnesota, spoke on "V-10 Bread."

New officers for 1958 are: chairman, A. A. Rolfe, Quaker Oats Co., Sherman, Texas; chairman-elect, George W. Schiller, Pillsbury Mills, Enid, Oklahoma; secretary-treasurer, E. A. Vaupel, Food Industries, Dallas, Texas.

Date for the next meeting has not been set, but it will be held in Fort Worth, Texas.

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New York Section met on November 12th at the Brass Rail Restaurant, New York, and heard C. L. Wrenshall, director of technical service, Chas. Pfizer & Co., Inc., speak on "Nutritional Plus Values for Cereal Products." Dr. Wrenshall stated that bread, unlike some other foods is not a source of empty calories; already a nutritious food, it can be made even better nutritionally by improving its protein with the amino acid lysine and by adding vitamins B_6 and B_{12}.

The speaker at the December 10th meeting was C. W. Ofelt, D.C.A. Food Industries, Inc., New York.

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Northwest Section met on December 27th. E. R. Ausemus, Division of Agronomy, University of Minnesota, and USDA agronomist, spoke on "The use of

of irradiation in wheat improvement." He discussed two or three successful uses and described some of his outstanding experiments with radiations and wheat evolution.

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Toronto Section No. 11 had its Christmas party on December 6th at the Westbury Hotel.

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Pacific Northwest Section No. 7 will hold its annual convention on June 23rd and 24th, 1958, at the Davenport Hotel, Spokane, Washington. Lynn Speaker is program chairman. Members of the local arrangement committee are: chairman, Don Colpitts; Monty Montzheimer, Martin Wise, Ross Bidwell, Frank Nataff, Waldon Chambers, S. M. Doos, and Grover Greeves.

• • • •

Niagara Section held its annual Christmas party on December 12th at the Town Casino.

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Northern California Section's members and wives met on Wednesday, December 11, at Guittard Chocolate Plant for a tour of the plant and laboratory, followed by dinner at The Carriage House in Millbrae.

In November, at a joint meeting with Institute of Food Technologists, members heard Thomas J. Schoch discuss the history of modified starches.

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Southern California Section, meeting on December 3, heard a talk on "Sense and nonsense about diets" by Prof. Lucien Bavetta of USC.

This section also met jointly with IFT in November. Thomas J. Schoch spoke on "Physical properties of food starches."

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Nebraska Section met with the Nebraska Bakery Production Club for their annual Fall Technical Session on November 23 in Omaha. Glenn Hargrave of the Paniplus Co., Kansas City, spoke on "The importance of production in successful bakery operation." There is need at present, he said, for more production men who have a full appreciation of their importance in the successful operation of their company's business. He cited present "cost-to-door" figures compared with those of past years, and showed how the production man is in a position to assist appreciably in controlling these figures. Intimate knowledge of the function of ingredients and equipment and transmission of this knowledge to co-workers is important. In a question and answer period, Mr. Hargrave responded to bakery production queries; Jay Grove, Nebraska Consolidated Milling Co., and Ed Rosse, Doty Laboratories, Omaha, handled questions concerning flour mill products control procedure and interpretation of laboratory reports as applied to bakery production.

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Pioneer Section met on December 7 at Hutchinson, Kansas. In the business session, members gave particular attention to plans for restoring the recently burned-out Milling School of Kansas State College. Manhattan. Approval was expressed for the efforts of the College toward rebuilding, and a gift of money from the Section's funds was voted to the Kansas Endowment Association to aid in rebuilding the mill. Members also authorized publication of a booklet giving the history of the Section, which, as its name implies, stems from the first cereal chemists' group to be organized.

Illustrating with colored slides, H. K. Parker of

(Please turn to page 17)

INSECT INFESTATION OF GRAIN AND CONTAMINATION OF CEREAL PRODUCTS[1]

KENTON L. HARRIS, U. S. Food & Drug Administration, Washington, D.C.

THE PROBLEM OF insect and rodent contamination of wheat, flour, and corn meal was brought into its true perspective by two surveys (7, 8) made by the Food and Drug Administration. A definite relationship was shown between insects in unmilled grain and insect debris in finished products.

As indicated in the table below, of the five tests for insect infestation in wheat there was a high correlation between the two tests (cracking-flotation for internal insects and stain for weevil egg plugs) which measured insects within the kernel, and the insect-fragment content of the finished flour. Direct comparison of results of the cracking-flotation test and insect-fragment counts in flours

Comparison of 266 samples	*Corr. coeff.*
Insect fragments in the flour vs.:	
Cracking-flotation for internal insects	0.90
Stain for weevil egg plugs	0.83
Surface flotation for whole insects	0.25
Surface flotation for insect fragments	−0.08
Pickout of insects and damaged kernels	0.13

(Table I) shows that the filth load of the flour increases with the insect load in the wheat.

TABLE I
COMPARISON OF CRACKING TEST TO RANGE AND AVERAGES OF CORRESPONDING FLOUR COUNTS ON ALL MILL SAMPLES

Whole Insects per 100 g. of Cleaned Wheat (Cracking Test)	No. of Samples	Insect Fragments per 50 g. Flour	
		Range	Average
0	116	0–34	4.8
1	38	2–29	13.2
2	22	2–47	24.5
3	24	21–104	44.3
4	18	17–156	64.8
5	11	36–89	62.4
6	9	30–91	56.9
7	2	111–140	125.5
8	5	49–73	58.4
9	2	49–57	53.0
10	2	36–118	77.0
11	4	25–191	101.0
12	2	78–204	141.0
13	2	205–261	233.0
18	2	229–242	235.5
20	1	......	342.0
22	1	......	212.0
26	1	......	365.0
31	1	......	114.0
41	1	......	748.0
48	1	......	1022.0
58	1	....	774.0

The relationship of insects in wheat to insect fragments in flour is complex and may be influenced by a number of factors. Among these are 1) type of insects and whether they are alive or dead; 2) type of wheat; 3) size and flow of the mill; and 4) type of cleaning equipment used.

The difference in fragmentation of live and dead insects has long been known. Several mill representatives have spoken of this difference as common knowledge in the milling industry. Dead and desiccated insects tend to break up easily. Live insects, especially larvae, tend to flatten out and become leatherlike and tail off with the germ. If large live larvae such as cadelles are present, they are found in this leatherlike condition in the bran. Since hard wheat requires more grinding in being reduced to flour than does soft wheat, more fragments might be produced from each insect in the hard wheat mill. On the other hand, soft wheat used to make cake flour is reduced to a finer particle size than hard wheat flour, and this might tend to produce more insect fragments in the soft wheat flour.

The same general picture prevails in the case of corn meal, as shown in Tables II and III, and as further information is developed the same over-all situation will no doubt be found in other cereal grains such as rice, rye, and buckwheat.

TABLE II
CORRELATION OF TESTS FOR INSECTS IN CORN TO INSECT FRAGMENTS IN BOLTED MEAL

Test	Uncleaned		Cleaned	
	No. of Samples Examined	Corr. Coeff.	No. of Samples Examined	Corr. Coeff.
Visual examination, 200 g.	73	0.48	57	0.72
Sieving, 1000 g.	72	0.36	58	0.58
Total damage by stain test, 200 kernels	72	0.42	57	0.69
Cracking test, 100 g.	72	0.67	78	0.87

The entrance of insects into a mill in the raw materials is a major factor in plant sanitation, since their slow but steady influx with the grain may result in a seeding of insects throughout the mill. Cotton *et al.* (4) reported that the important avenues of infestation in flour mills are 1) the entering grain stream; 2) infested flour used in blending operations; 3) infested returned goods; 4) returned second-hand bags; 5) second-hand machinery; 6) infested feeds stored in the mill or near milling machinery; and 7) near-by elevators. If the incoming insects are the type that will grow in semimilled and milled products, they will breed in and infest the entire mill. Such mill-infesting species, however, usually are not those commonly found as internal pests of wheat.

Insects infesting a mill get into the moving flour stream from time to time and may be ground into fragments or bolted out over one of the many sifting operations, con-

[1] Manuscript received June 3, 1957. Presented at the annual meeting, San Francisco, Calif., May 1957.

TABLE III

COMPARISON OF RESULTS ON THE CRACKING-FLOTATION OF CORN TO INSECT FRAGMENTS IN THE BOLTED MEAL (UNDEGERMINATED)

CRACKING-FLOTATION: 100 G. CLEANED CORN (No. of Insects)	NO. OF SAMPLES	INSECT FRAGMENT COUNT OF 100 G. MEAL	
		Range	Average
0	13	1–29	6
1	5	0–66	17
2	13	2–37	16
3	9	0–86	34
4	8	2–56	24
5	3	24–111	60
6	5	67–176	114
7	1	......	47
8	2	52–70	111
9	3	15–212	143
10	1	......	137
11	2	113–269	191
12	3	82–324	164
14	3	88–517	172
15	1	......	114
17	1	......	359
18	1	......	256
19	1	......	260
34	2	246–406	326
40	1	......	523

taminating the product with recognizable and sometimes identifiable pieces of their hard outer shells. Even those insects which are bolted out, sometimes drop into the mill-stream pieces of appendages lost during normal wear and tear and these may or may not be bolted out.

X-Ray Inspection Technique

Tests in our laboratory have clearly indicated that the most reliable and yet practical means of measuring internal infestation of grain is low-voltage radiography. This X-ray technique was first successfully applied to wheat by a group at Kansas State College (13, 16).[2] Following their pioneering we jointly examined a series of samples (17) and showed that the X-ray procedure is a valid means of measuring internal infestation. Moreover, the procedure is directly related to the cracking-flotation method used in the 1950-51 wheat survey. A summary of the work by Nicholson *et al.* (17) is given in Table IV.

Since the work on the X-ray inspection technique was published, the search has continued for a precise, sensitive, simple, fast, inexpensive testing procedure that could be used equally well by untrained laymen or skilled technicians working at farm, country elevator, terminal, or mill level. The X-ray procedure meets all of these requirements except the cost factor and possibly the need for trained personnel. Cost per sample is not necessarily high, but the search for a method to be used by untrained personnel or those unfamiliar with the particular product or problem seems to be beset with insurmountable difficulties. One outstanding methods-research group recognizes this. The Association of Official Agricultural Chemists (2) has sought to present methods "that have convenient practical application, and which at the same time give reproducible results in the hands of *professional analytical chemists.*" (Author's italics.) Methods designed for push-button, unthinking operations require expensive instru-

[2] Katz, R., et al. X-ray inspection of wheat. Nondestructive Testing, Fall 1950.

TABLE IV

RESULTS ON 173 SAMPLES OF WHEAT BY CRACKING-FLOTATION, VISUAL EXAMINATION, AND X-RAY

(Summarized from Nicholson *et al.*[a])

INSECTS BY CRACKING-FLOTATION:	NO. OF KERNELS WITH EXIT HOLES	DAMAGED KERNELS BY X-RAY	NO. OF SAMPLES
Av/100 g	*Av/100 g*	*Av/100 g*	
0	0.2	5.7	3
1	0.1	4.8	10
2	0.6	6.6	10
3	0.6	10.6	7
4	0.7	10.2	9
5	1.1	10.5	12
6	1.9	16.8	6
7	1.3	13.3	9
8	1.3	14.4	7
9	2.8	18.2	5
10	1.2	17.8	4
11	2.5	19.9	7
12	2.9	24.2	5
13	1.6	17.0	9
14	3.3	20.5	8
15	2.1	19.4	5
16	4.2	24.0	3
17	3.0	19.0	2
18	3.2	25.6	8
19	2.4	26.2	4
20	4.0	33.3	3
21	4.8	27.0	3
22	5.4	31.0	4
23	3.8	21.5	2
24	2.0	33.0	1
25	9.8	42.3	3
26	6.5	42.6	5
27	5.2	26.5	2
28	5.2	36.7	3
30	9.5	48.0	1
31	5.5	35.0	2
34	10.5	51.0	2
35	3.5	43.0	1
46	8.0	50.0	1
47	10.0	53.0	1
48	5.5	57.0	1
52	7.0	55.0	1
55	13.0	70.0	1
78	11.0	76.0	1
91	43.0	140.0	1
119	15.0	112.0	1
Totals 545	556	3761	173

[a] See reference 17.

mentation, and even these procedures need highly skilled personnel. The attempt to find a method meeting all of the above requirements to the satisfaction of all interested parties is unrealistic, and further search should not delay application of the X-ray procedure as a means to implement the clean-grain program. Moreover, while dependence upon gross sorting techniques makes it difficult to detect lower levels of infestation, the radiographic method gives not only a more complete indication of the damage present but also the needed flexibility to permit lowering the existing standards for infestation.

Sampling Problems

Similarly, the problem of satisfactory methods for detecting internal infestation should not be obscured by the sampling problem. The difficulties involved in sampling a heterogeneous lot of bulk grain that has been loaded in such a way as to conceal inferiority are problems not of testing but of sampling. An approach that might be quite satisfactory at harvest or at the country elevator might be unsatisfactory at the terminal or mill, and a

detailed examination required at the mill might be uncalled for at the farm or country elevator level.

For example, during harvest most deliveries will be uniformly sound as regards internal insects, and there is little need to delay deliveries pending a laboratory analysis. It is well recognized that "the experienced grader has a great advantage over the beginner in accomplishing more and better work with less effort because he knows from a general examination of the sample what factor or factors he should determine and what factors he may disregard" (3). Thus at this point, where time and cost factors loom large, visual examination by an experienced grain man will be adequate to spot those lots that require further attention. However, local groups might find it advantageous to have an X-ray service available locally to provide for premarketing information on their grain or to provide accurate information on lots which are "suspect" on visual examination. At the terminal and mill level careful visual examination is still valuable, but the cost of the X-ray equipment per sample is minimized and there is time to expose and develop radiographs in ordinary laboratory facilities. Thus, the level at which the examination is made significantly influences the requirements of the test.

Variable Reactions and Results

Another consideration that has led investigators off on tangents is the attempt to make the test react in an identical manner to all wheats and all insects; marked differences, for instance, are to be expected in the buoyancy of a shrunken kernel with air pockets compared to that of a solid plump kernel. Hence, acceptance of some of the flotation procedures has been poor (1, 15, 18). This is a real difficulty, normal to wheat, since individual kernels of wheat vary in size, shape, and over-all compactness, and kernel variation is not overcome by insect tunneling, the extent of which also varies from minute punctures to extensive hollowing of the kernel. However, the X-ray procedure works satisfactorily within the entire range of variation in wheat and in extent of insect tunneling.

If a sample of grain is infested, one or more of several species of insects may be present. Much time has been spent in trying to standardize a visual measurement of kernel damage or a specific test for a specific insect (6, 14) with the actual number of insects within the kernels. There is little reason to suppose that this is a fruitful avenue of investigation; and to impose a requirement that individual samples all show the same exact relationship to another criterion of contamination is an insurmountable burden on a test procedure. The amount of visible surface damage by the lesser grain borer, which does a rather large amount of wandering and chewing, will be relatively high; that by the rice or granary weevil, which does some surface puncturing as an adult but spends most of its life within the kernel, will be less; that by the flat grain beetle, which often enters the kernel through the already "broken" attachment end, will be still less.

The X-ray procedure will readily detect all but the most minute insect damage in all cereal seeds, and even such minor damage can be detected if the radiograph is examined with sufficient care. With this procedure, damage to wheat by the flat grain beetle, usually confined to the germ end, is less readily detected but can be evaluated whenever excessive germ loss is noted. It is the most reliable way to measure internal infestation. It is precise, sensitive, simple, rapid, and inexpensive when considered on a per-carload or per-sample basis over the life of the equipment. Moreover, it furnishes an automatic permanent record that can accompany the sample report.

Wagner, in 1952 reported at an AACC tri-section meeting[3] the results of collaborative testing of wheat using the X-ray technique. Comparable counts were obtained in six different laboratories. In a discussion session at the same meeting, J. L. Spaulding mentioned that radiographic examination of corn had revealed the presence or absence of cracks in the endosperm, and that information so obtained would permit more efficient milling with an accompanying saving of power consumption.

The rodent problem, although serious from the contamination standpoint, has usually been judged by visual examination for the presence or absence of rodent pellets. This simple methodology has sufficed to implement the clean-grain program. Rat and mouse pellets may contribute filth to the finished product, and also indicate the presence of rodent urine. Rodent urine on wheat, including its penetration into the kernel (5) and methods for its detection on grain (12), has been investigated at the University of Minnesota and is currently being subjected to collaborative study by an Associate Referee of the Association of Official Agricultural Chemists.[4]

Summary

Recently developed techniques permit the microscopist to determine specific types of insect fragments in finished cereal products, and hence to evaluate the significance of the findings (9, 10, 11). With these newer techniques, now being extended substantially, regulatory agencies are better able to establish and place responsibility for any contamination; control laboratories can determine the etiology of a contamination with more certainty, and so clean out infested areas. Thus, we have methods for examining grain for rodent pellets and internal insects, and methods for rodent urine are being developed. Laboratory examination of the finished product will provide a final check on the condition of the raw materials and sanitation in the processing plant. With the existing tools being applied, we can look forward to continuous improvement in cleanliness of cereal products.

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UREASE ACTIVITY IN SOYBEAN PRODUCTS[1]

L. R. BROWN and T. J. POTTS, co-chairmen, joint committee on soybean products of the AACC and AOCS

DURING THE PAST 20 years the soybean industry has had phenomenal growth, and the soybean crop has come to be one of the major sources of income of the American farmer. The U.S. Department of Agriculture estimate for the 1956 crop year indicates that more than 21 million acres were planted to soybeans with a yield of approximately 456 million bushels and a market value in excess of 1 billion dollars.

More than 90% of the soybeans which are harvested go into commercial channels for processing, the end products being primarily oil and protein. Soybean protein has many diversified uses, including foods, feeds, adhesives and glues, pharmaceuticals, and a host of others. Such widely different uses require variations in the properties of the proteins used; some require a raw, undenatured product, others a completely toasted, denatured product, while still others require protein modification at some point between these two extremes. Much study has been given to this problem, and numerous procedures have been developed in an attempt to evaluate or measure the degree of heat-treatment which the protein has received.

Probably the most widely used method is the measure of the residual urease activity in the product. Soybeans contain the heat-labile enzyme urease, and a measure of the amount of the enzyme remaining after processing is a fair indication of the degree of denaturation which the protein has undergone. However, since no generally accepted method exists for measuring this property, it is evident that there is a definite need for such a test. Residual urease activity alone is often not adequate to give the complete picture on the type and amount of heat-treatment received by soybean products, and other measures should be taken into consideration, particularly when the history of the material under examination is not known. Two of these additional measurements are protein dispersibility, or solubility, and color. A study of these methods is to be undertaken by the committee soon.

Methods and Major Results

A collaborative study and evaluation of current methods to detect degree of heat-treatment of soybean products seemed advisable in view of the wide acceptance of soybean protein, and a joint committee from the American Oil Chemists' Society and the American Association of Cereal Chemists was appointed to investigate and report on the matter. This report is a summary and recommendation on the use of methods to detect heat-treatment of soybean products by measurement of the urease activity.

A 14-member committee was established, composed of representatives from both consumers and processors, thereby serving as a good cross section of the industry. After much preliminary investigation and correspondence, four samples of various types of soybean meal and soybean flour were submitted to the collaborators as follows: 1) an overheated soybean meal; 2) a well-processed soybean meal; 3) a soy flour high in urease activity; and 4) a 1:1 blend of 2 and 3.

The collaborators were requested to assay for urease activity by four different methods: modified Caskey-Knapp (2); conductrimetric (3); titration UA-1 (1); and titration UA-4 (3). It was further requested that the test samples be stored under refrigeration until used for analysis, and that duplicate determinations on consecutive days be made in all cases. In addition to the analytical data, collaborators were requested to submit their comments on the four methods used, covering the following points: simplicity; adaptability to multiple determinations; reproducibility; and precision.

Analytical data were received from 10 of the collaborators, and a summary of results is given in Table I.

Conclusions and Recommendations

The collaborators were unanimous in the opinion, based on their experiences with the methods studied, that the conductimetric method, while giving good results, was rather objectionable because it required special equipment and would therefore not be widely accepted generally. Method UA-4 was found objectionable because it had a rather poor reproducibility, required a double-titration procedure, had a fading end point, and was more

[1] Manuscript received November 6, 1957.

TABLE I
COMPARISON OF FOUR METHODS OF MEASURING UREASE ACTIVITY OF SOYBEAN DERIVATIVES

STATISTIC	SAMPLE NUMBER			
	1	2	3	4
	Modified Caskey-Knapp [a] (pH increase)			
Mean	0.01	0.04	2.00	0.24
Range	0—0.04	0—0.08	1.84—2.24	0.09—0.39
Std. deviation from the mean	0.03	0.04	0.12	0.08
	Conductrimetric [b] (mhos × 10^3)			
Mean	0.04	0.09	2.71	1.43
Range	—0.168—0.22	—0.171—0.32	1.35—4.03	0.88—1.99
Std. deviation from the mean	0.07	0.11	0.79	0.26
	Titration U A-1 (ml. N/10 acid) [c]			
Mean	0.04	0.20	45.54	3.38
Range	0—0.12	0—0.90	28.76—90.00	1.71—8.70
Std. deviation from the mean	0.05	0.30	17.22	4.28
	Titration U A-4 [d] (ml. N/10 alkali)			
Mean	0.07	0.05	12.19	1.05
Range	—0.24—0.63	—0.23—0.60	8.30—14.81	0.61—1.56
Std. deviation from the mean	0.18	0.10	1.92	0.21

[a] See reference 2.
[b] See reference 3.
[c] See reference 1.
[d] See reference 3.

time consuming. The principal objection to method UA-1 was its poor reproducibility in high urease-activity products. This objection might be overcome with adequate buffering or by using a smaller-size sample.

Because of these objections to the other three methods and also because the modified Caskey-Knapp method is in rather wide use with fairly satisfactory results, the joint committee recommended that the modified Caskey-Knapp method, as published here, be adopted as tentative by both organizations.

Collaborators on this study were J. S. Baker, L. R. Brown, E. F. Budde, M. W. Dippold, K. E. Holt, A. F. Kingsley, George Kyser, John E. Lawler, V. C. Mehlenbacher, D. C. Meek, T. J. Potts, G. H. Rapaport, Edward C. Roberts, and M. L. Valletta.

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UREASE ACTIVITY
MODIFIED CASKEY-KNAPP METHOD

Definition: This method determines the residual urease present in soybean products under the conditions of the test.

Scope: Applicable to soybean meals, soyflour, and mill feeds.

A. Apparatus:

1. Water bath capable of being maintained at temperature of 30° ±0.5°C.
2. pH meter equipped with glass and calomel electrodes and with provision for testing 5 ml. of solutions. It should be a precision instrument with a sensitivity of ±0.02 pH units or better, and with a temperature compensator.
3. Test tubes, 20 mm. by 150 mm., fitted with rubber stoppers.

B. Reagents:

1. Phosphate buffer solution, 0.05*M*.: dissolve 3.403 g. of KH_2PO_4 in approximately 100 ml. of freshly distilled water. Dissolve 4.355 g. of K_2HPO_4 in approximately 100 ml. of water. Combine the two solutions and make to 1,000 ml. Adjust the pH of the solution to 7.0 with a solution of a strong acid or base before using.
2. Buffered urea solution: dissolve 15 g. urea in 500 ml. of phosphate buffer solution. Add 5 ml. of toluene to serve as a preservative and to prevent mold formation. Adjust pH of urea solution to 7.0 as in B1.

C. Preparation of Sample:

1. Grind sample as fine as possible without raising temperature. It is preferable that at least 60% of sample pass a No. 40 U.S. Standard sieve. Soyflour requires no further grinding.

D. Procedure:

1. Weigh 0.200 g. of prepared sample into test tube. Add 10 ml. of the buffered urea solution, stopper, mix, and place in water bath at 30°C. Note time. (Test.)
2. Prepare blank by weighing 0.200 g. of prepared sample into test tube. Add 10 ml. of phosphate buffer solution, stopper, mix, and place in water bath at 30°C. Note time. (Blank.)
3. Allow interval of 5 minutes between preparing test and blank.
4. In both test and blank runs, remove tubes from water bath at end of 30 minutes and determine pH of the supernatant liquid. Take pH reading at exactly 5 minutes after removal of tubes from bath. See note G1.

E. Calculations:

1. The difference in terms of pH between test and blank runs is recorded as pH increase or urease activity.

F. Precision:

1. Intralaboratory precision on cooked material is 0.03 pH units and 0.10 pH units on uncooked material. Interlaboratory precision should be 0.05 and 0.15 pH units respectively.

G. Note:

1. Care must be exercised to prevent contamination of all glassware or electrodes. Should pH instrument fail to deliver a prompt stable reading, check into the difficulty. Occasionally trouble is caused by coating from soluble fraction of soybeans on fiber in calomel electrode.
2. This method is a modification of the procedure of Caskey and Knapp (2).

Local Sections:

(Continued from page 11)

Wallace & Tiernan described the John C. Baker Continuous Do-Maker. The machine is very suitable for bakeries with production great enough to warrant its use, he said, and while it reacts best to uniform flour, it is adjustable to variances in flour.

John A. Shellenberger of Kansas State College reported on the visit to Europe of the U.S.-European Wheat Market Team, timed to coincide with the Food Fair at Cologne, Germany. Among other U.S. food exhibits were samples of good hard wheat. Unfortunately the Germans associate good wheat with Manitoba, Dr. Shellenberger said, and this misunderstanding, together with their local laws supporting prices and limiting the amount of foreign wheat that can be used, presents a real obstacle to our exporting wheat to Europe. However, Dr. Shellenberger pointed out, Europe does need American hard wheat for blending with its own soft wheat, and he suggested that our wheat should be offered there not according to our conventional grading system but on the basis of the quality and nature of the sample.

Paul Imes, Carey Salt Co., Hutchinson, speaking on "The romance of salt," reviewed some of the recorded history of salt. The first attempts to recover it were by evaporation of sea water, he said, but about the year 1000 a salt mine was opened in Poland, which is still operated. "There is enough salt in Kansas to last the United States three million years," Mr. Imes declared. It was found in many marshes in the area in earlier times, but commercial production was low until great underground deposits were discovered in 1887.

. . . People

J. Ansel Anderson, Grain Research Laboratory, Winnipeg, in Europe representing the Canada Dept. of Trade and Commerce.

Stanley Block, Milton-Freewater laboratory, transferred to Wenatchee, Washington, where he will be in charge of the laboratory.

W. Elliot Brownlee promoted to assistant vice president, manufacturing, at Sunshine Biscuits, Inc. Mr. Brownlee was graduated from the University of Minnesota with a Bachelor of Science degree in 1928 and received his Master of Science degree in 1929. He has been with Sunshine Biscuits for 28 years.

Walter Bushuk at the Centre des Recherches sur les Macromolecules, Strasbourg, France, on a year's leave of absence from the Grain Research Laboratory, Winnipeg.

Carol Campbell, formerly with department of food technology at MIT, now starch research chemist, Clinton Corn Processing Co., Clinton, Iowa.

Edward F. Cvejdlik appointed plant manager of Omar, Inc., at Omaha.

Richard Hale leaves Polak's Frutal Works, now with Van Amerigen Haebler, Chicago.

Frances E. Horan transferred from Huron Milling Co.'s laboratory at Harbor Beach, Michigan, to Hercules Research Center, Hercules Powder Co., Wilmington, Del.

Ogden C. Johnson appointed senior research chemist at food laboratory, A. E. Staley Mfg. Co., Decatur, Ill.

Ellen Ragen now on the laboratory staff of Centennial's Spokane Mill, and will do the test baking.

Perie Rumold, on leave from his position as head of the Quality Control Division, UNESCO, Beirut, Lebanon, visits friends in the Kansas City area.

Gordon F. Swineford, formerly with Union Starch and Refining Co., now plant manager for Chas. A. Krause Milling Co., Milwaukee.

John H. Woychik appointed research chemist in composition and molecular structure unit, cereal crops section, USDA, Peoria, Ill.

. . . Products

Cargill Incorporated, Minneapolis, used black Visqueen polyethylene film to store nearly 600,000 bushels of oats this summer. A huge plastic "bag" was fabricated by pasting each plastic sheet together with 2-inch Permacel tape. Visqueen black polyethylene film is manufactured by the Plastics Division of Visking Company, Division of Union Carbide Corporation, Terre Haute, Ind.

• • •

Mallet & Co., Inc., Pittsburgh, have introduced a group of drum pumps constructed of stainless steel and aluminum, which are designed to reduce the labor, time, and cost of emptying food products by hand. The heavy-duty electric drum pump is described as able to transfer corn syrup, jellies, compound greases, and other heavy food products at rates up to 25 pounds per minute, without waste and contamination. Priming is not necessary. The pump is mounted on a lid which will cover any 55-gallon open-style steel drum and is available also for use with odd-sized drums. The lid need not be clamped on for efficient operation.

. . . Patter

Corn Products Refining Co. has awarded gifts ranging from $100 to $2,000 to 75 American colleges and universities. The donations were proportioned according to the number of people now with Corn Products who attended these schools.

• • •

Expanded laboratory and greenhouse facilities for agricultural chemicals research are being constructed in St. Louis by Monsanto Chemical Co.'s Organic Chemicals Division. Included are a two-story building housing offices, conference rooms, laboratories, and library, and eight adjoining greenhouses and one-story material receiving and storing accommodations. They will be devoted exclusively to research-scale experimentation.

• • •

The Du Pont Co., Wilmington, Del., is putting more than $15,000,000 into its program of fundamental research this year. This program, which is now 30 years old, is the search for scientific knowledge without regard to specific commercial objectives.

Beginning with a five-man investigation of molecular structure, the basic-research work now ranges across organic and inorganic chemistry, polymers and plastics, biological chemicals, metals and alloys, fibers and films, and others. Neoprene and nylon are two of the results of the program.

• • •

The sixth annual meeting of the American Association of Feed Microscopists will be held at the Chateau Laurier Hotel in Ottawa, Canada, on June 16, 17, and 18, 1958. The meeting will be sponsored by the Canada Department of Agriculture. Write for information to G. M. Barnhart, Secretary, Missouri Department of Agriculture, Jefferson City, Missouri.

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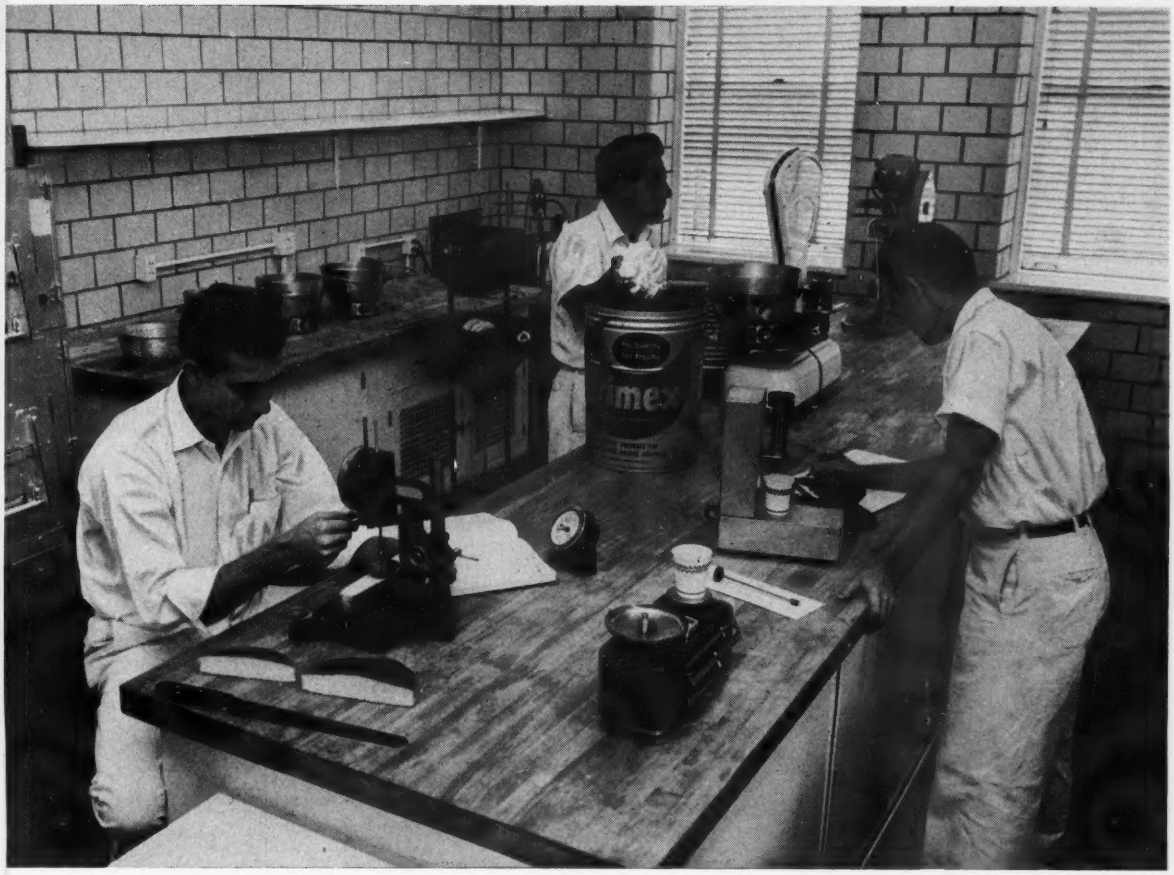
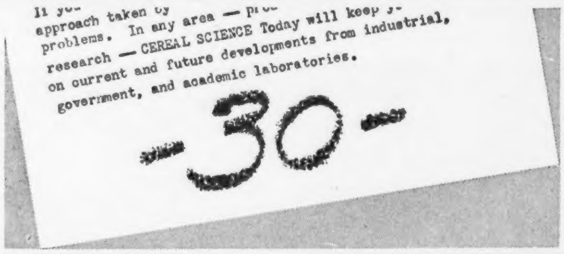
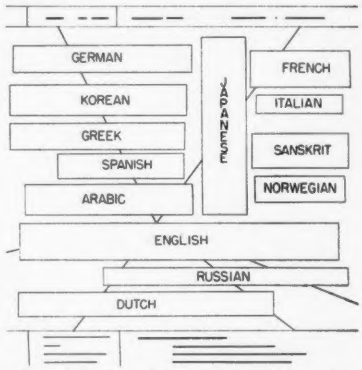
Brinkmann Instruments, Inc., and C. A. Brinkmann & Co., Inc., have moved into a new headquarters building in Great Neck, N. Y. The company's products will be on permanent display in an attractive show and conference room; this room has facilities for larger meetings, and will be available to scientific and professional organizations.





December Cover

Since the publication of our December issue we've had a number of inquiries about the multi-lingual Christmas cover. Many of our readers were not quite sure about one or two of the languages so we've provided a key sketch for identification. How did you rate?



It might be of interest to know that CEREAL SCIENCE TODAY travels to 45 foreign countries and its sister publication, *Cereal Chemistry*, circulates in 63 foreign countries.

Advertising—Good or Bad?

In today's world of the "hard sell" its rather difficult to imagine a situation where advertising isn't present in some form or another. We are greeted by advertising messages in every medium of communication in existence from the moment we awake until we retire at night. No wonder after such constant bombardment we become defensive about any sales pitch.

What we should all remember is that everyone of us is both a buyer and a seller. All consumers eventually become sellers either of their services or some product they have processed or manufactured. Thus at some time or another we all depend upon advertising to help us sell.

In the technical field advertising is used for somewhat of a different purpose than in the normal commercial channels. Technical advertising tries primarily to sell an idea or furnish technical information which will stimulate ideas. Thus every good technical advertisement contains product information of potential value to some reader. Until you read the ad, you can't be sure the information won't benefit you and your work.

What we're saying, of course, is that all technical people should regard technical advertisements as part of their routine reading material. This does not mean you have to buy everything that is offered or talk to every salesman that's on the road. It merely means that you owe it to yourself to see what's currently available in your field or what's being emphasized by your competitor.

Thanks

We'd like to take this opportunity to express our appreciation to all members of the AACC who answered and returned the recent "Business Classification" questionnaire. Our return at the present moment is approximately 80%, a truly remarkable response. Its this type of cooperation from our members that makes the work of the headquarters office so rewarding. If any of you still haven't sent in your questionnaire please do so now. We'd like just as much information as possible so our publications and our activities might better serve you.

Volume III

With this issue we start the third year of CEREAL SCIENCE TODAY. A group of excellent articles have been scheduled for the coming months written by experts in a wide variety of cereal-chemical fields. Next month we shall publish the preliminary program for the 43rd Annual Meeting of the AACC to be held in Cincinnati on April 7. Be sure and watch for it.

And don't forget we're here to serve you. Let us know what you want and we'll try and oblige.

R. J. T.

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